

Design Decisions

Microcontroller

- ESP32 S3 - A cheap yet powerful microcontroller that will be able to handle the job of powering the motor. It is lightweight too which makes it great for a project heavily based on weight.

Motor

- XING-E Pro 2207 2450KV Motor - Makes thrusts in the thousands which is more than enough for the project. This is enough thrust to have some headspace in case the weight of the chassis is more than was expected (combined with the weight of the electronics themselves and maybe friction). The propeller has to be 5 inches in diameter. Weight is also pretty low which is a plus.

Motor Driver

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Distance Sensor

- Adafruit VL53L0X - uses a laser to measure the distance. Has a range of up to 2 meters which is enough for this prototype. Just make sure the spot that the distance sensor uses to measure the distance is white for better reflectability.

Battery

- Lumenier 550mAh 4s 80c Lipo Battery - Has the required voltage for the motor and motor driver to run: both need 4s. The amount of current it can discharge is enough to cover the electronics, especially the motor which needs 15 mA.

LED

- LED - have two LEDs (one red and one green) to tell different states of when to physically interact with the drone. They are simple, cheap, and light.

Button (Switch)

- Button - used to turn the drone on/off. Could also look into adding more functions in the future. It's easy to use and easy to implement to the hardware and software. Very lightweight.

Buck Regulator + LDO for 3.3V to esp32+distanceSensor

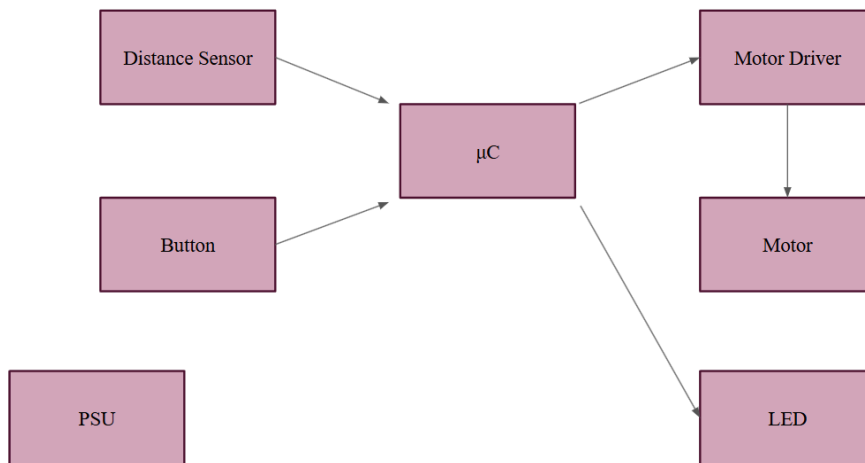
- Buck Regulator MP1584, sensitive parts (esp32, sensors) need 3.3V or they get fried
- LDO (one of the following parts will suffice; LDO needed to clean up noise of buck reg)
 - AMS1117 – 3.3
 - AP7333

TVS diode

- TVS diode is needed because plugging/unplugging LiPo, or motor switching noise, might be an issue due to voltage spikes

Addendum

- Since sensitive parts need 3.3V, and battery can run out and drop below that, a warning system for this is needed, hence a beeper starting at around 3.5V
 - planned part: 1-8S LiPo Low Voltage Buzzer Alarm
- Miscellaneous parts to foolproof it from getting fried from mistakes
 - 22-100 μ F electrolytic on input to MP1584 buck, plus 0.1-1 μ F ceramic at X5R/X7R
 - polyfuse at battery input to protect buck/ESC/etc. (to protect ESP from bursts of current)
 - p-channel MOSFET, backwards to block reverse polarity, as diode with low drop (to not fry stuff if battery is connected incorrectly)
- Current Block Diagram:



- Current Bill of Materials:

<u>Electronic</u>	<u>Link to Market Place</u>	<u>Status</u>	<u>Cost</u>
Microcontroller	ESP32 S3	Bought	
Motor	XING-E PRO 2207 2450KV	Available	
ESC		Available	
Distance	Adafruit VL53L0X Time of Flight Distance Sensor	Available	
PSU	Lumenier 550mAh 4s 80c Lipo Battery (XT-30)	Available	
Charger	Gens Ace iMars Mini G-Tech 60W 2-4S 5A	Available	
Propeller	Gemfan Hurricane SL 5125 3-Blade Propeller	Available	
LED	N/A	Bought	
Button	N/A	Bought	
Buck Regulator	N/A	Available	
LDO	N/A	Available	
3.5V Beeper	N/A	Available	
TVS diode	N/A	Available	
polyfuse at V in	N/A	Available	
capacitors	N/A	Available	
MOSFET	N/A	Available	